EXPORT EARNINGS INSTABILITY AND ECONOMIC GROWTH IN SUB SAHARA AFRICAN COUNTRIES

Paulos Gutema*

ABSTRACT

The paper investigates the impact of uncertainty generated by export earnings instability on economic growth. A model that links uncertainty to economic performance is developed, and, from the model, the condition under which outward-oriented economic policy contributes positively to economic growth was set. From panel data analysis, it is inferred that to benefit from an outward-oriented economic policy, the stable component of export revenue of the region has to grow annually by at least 7.5%. If this condition is not satisfied, the policy acts adversely on economic performance by inducing resource misallocation.

1. INTRODUCTION

Sub-Saharan African (SSA) economies have been experiencing very slow growth for the last three and a half decades. According to Sachs and Warner's (1997) estimate, the region's annual average change in GDP per capita was only 0.8% per year over the period 1965 - 1990. By contrast growth in some of South East Asian Countries was 5.8% and that of the rest of the less developed countries (LDCs) was 1.8%.

Such slow growth in SSA has been a point of much concern for African specialists, development economists and other scholars as the prevalence and severity of the problem seem different from that of other developing countries. In the search for the cause of such a problem, some of them consider poor policy as the primary cause while others emphasise on the underlying growth conditions–like colonial legacy, ethnic diversity and tribal divisions, and geographical factors.

---

* Senior Expert of export promotion at Ministry of Trade and Industry, Box 33229, Addis Ababa, Ethiopia. I gratefully acknowledge the very helpful comments of Dr. Abdulhamid Bedri, my M.sc. thesis advisor, Dr. Alemayehu Gada and the two anonymous referees. The final version of this article was submitted in December 1999.

From the latter group, Easterly and Levin (1997), for instance, besides providing evidence for strong relationship between the underlying growth conditions and growth, described how these conditions themselves contribute to poor public policy. That is, poor policy itself is not a self-standing cause, but rather a consequence of other adverse factors. Galup and Sachs (1998), as cited in UNCTAD (1998), for example, indicates that protectionist policies in SSA (considering it to be inappropriate) could be the result of adverse underlying growth conditions.

Based on the uniqueness of these adverse factors to Africa, as Cuddling et al. (1996) note, one often hears the argument that there is no presumption that the usual economic prescriptions should apply in addressing Africa's economic problems. Other scholars prefer to argue the other way round. For instance, Sachs and Warner (1997) find that poor economic policies, and most importantly, Africa's lack of openness to international markets have played a particularly important role in the slow growth than the underlying growth factors. As a result, they prefer to stress that there is no need for special theory for Africa with regard to economic growth.

This study departs from this point of debate by asking the following question: Even if the underlying growth conditions in Africa are considered to be similar to that of the other developing countries, is the policy of openness to international market truly suitable for accelerating SSA economic growth?

While posing this question, the maintained hypothesis is that the effectiveness of outward oriented economic policy (OOEP) depends on the fulfilment of some economic conditions, and if such conditions are not fulfilled, policy could act adversely in the attempts made to accelerate economic growth. This hypothesis is formulated on the ground of the following point.

The advocates of policy failure claim the prediction of neo-classical trade model as the theoretical justification of the OOEP. However, the claimed model relies heavily on a number of heroic assumptions that can not be valid in LDCs' context. One of the assumptions, having special relevance to this study, is the absence of uncertainty. Theory, however, indicates that the prediction of the model cannot hold when this assumption is removed. Moreover, we find ample evidence indicating the volatility of earnings from the export of primary commodities. This volatility, indeed, generates uncertainty in the system in general. From this point it seems reasonable to suspect the attainability of dynamic gains of trade from primary commodity exports.

To examine the hypothesis, a model that links uncertainty with economic growth is developed. The model then examines the conditions under which the outward-oriented economic policy may accelerate economic growth.

To this end, the study follows two main approaches. The first starts from Feder's (1982) formulation. It splits export earnings into its stable and unstable components to derive the model. Having the model developed that way the approach tries to drive a prerequisite for a positive contribution of export-promoting policy to economic growth. This approach makes some behavioural assumptions of the involved economic agents. In addition to the behavioural assumption, the approach also assumes that the underlying economy is bi-sectoral: export sector and non-export sector, which may have factor productivity differential as well as externality between the sectors.

The second approach attempts to estimate the model with statistical data. At this stage, panel data analysis is employed. Based on the estimated parameters, the conditions for effective OOEP for SSA is outlined.

2. LITERATURE REVIEW

Over the last 15 years or so, OOEP has gained strong dominance among academics and development-oriented institutions. Many national aid agencies in the North have been convinced of the suitability of outward approach for the purpose of economic growth. A number of countries have made strong effort to shift from an essentially import substitution to a more outwarded approach, other countries are still trying to do so, and virtually all countries are being urged to take similar measures by aid donors and external economic advisors. But, a very basic question, demanding considerations, is whether all these changes are based on belief or fact. To shed some light on this point, let's try to see the theoretical foundation of the policy from the perspective of uncertainty that has got special relevance to SSA.

Even if the justification of OOEP relies heavily on findings of empirical studies made in the 1970s, the advocates of the policy claim the suitability of neo-classical trade model for explaining the availability of static and dynamic gains from the policy. See, for example, Ram (1985) and Dornbush (1992).

According to neo-classical trade model, countries benefit more from free trade than autarky, and the benefits exist as a result of production specialisation and efficient resource allocation. In fact, the prediction of availability of potential gains from trade heavily rely upon assumptions which may not hold in the real economic life of LDCs. On this point, Strydam (1995) states that neo-classical trade theory provides us with the most unqualified support for international trade as a growth factor, based on a very restrictive assumptions. Among the assumptions used by the model that called the attention of recent researchers are: perfect competition in the international trade, constant returns to scale, rational behaviour of agents that work through utility

maximisation, free factor mobility, full employment of resources, and absence of uncertainty in the trade system.

Recently, there is a large volume of theoretical literature that examines what happens to the prediction of the neo-classical trade model when the model is exposed to elements of uncertainty. Some of these studies tried to mimic the assumption of no uncertainty by saying there exist a complete risk market that serves any form of risk generated in the process of trade and production. Under such situation, they managed to prove the validity of the model Dumas (1980) and Helpman (1988). But a very simple question to be raised here is whether LDCs have risk markets for any form of risk that exists in the process of international trade.

Other studies made on this area build their model without complete risk markets, but assume that firms have fixed levels of utility (e.g. Mayer 1976). The study was able to prove the validity of neo-classical trade model prediction within such circumstance. Here, too, one may ask questions like 'is a firm's utility truly fixed?'

Still others made their study on the issue of uncertainty assuming that the number of firms involved in international trade is fixed. For such studies, see Batra (1975), Sakai (1978), Pomery (1984). Even if the assumption is unrealistics, the neo-classical trade model breaks down under uncertainty. In short, from these theoretical researches, it is possible to argue that the claimed gain is uncertain particularly for developing countries like SSA, whose export earnings are mostly from primary commodities.

In the preceding paragraphs, some of the theoretical works done to analyse what happens to the prediction of neo-classical trade model under uncertainty, from static point of view, was reviewed. Nevertheless, dynamic issue, which is our basic point of interest, requires some more investigation to argue for or against the prediction of the neo-classical model. To move a step towards filling this gap, let us consider uncertainity in export earnings.

Generally speaking, uncertainty in international trade emanates either from supply side or from demand side or from both. The effects of the factors influencing demand side can be reflected through international price, while that of the supply side is reflected through quantity supplied to the international market. On the other hand, the level of export earnings is determined by quantity supplied and the price. Hence, the uncertainty existing in the international trade can be well represented by the uncertainty observed in export earnings, which is manifested through and measured by export earnings instability. However, it is difficult to find a well-established and satisfactory theoretical framework that reveals the impact of such uncertainty on the dynamic benefit of international trade, specially in the long run context. Consequently, one may observe some limitations on some of the existing empirical works.

A common limitation of studies that have relevance to this study is that they lack a satisfactory theoretical estimating equation that links Export Earnings Instability (EEI) with economic growth. That is, most of the equations used in the studies have not been derived systematically starting from a valid growth model, in a way that is consistent with their hypothesis testing. In the absence of a theoretical foundation, regressing different variables is likely to lead to inconsistent and contradictory results. Glezakos (1973), for instance, was criticised by Lim (1976) for its lack of derivational procedure even if the setting of the functional form is logically consistent with the hypothesis to be tested. MacBean (1966) is also criticised for lack of explanations or theoretical ground for choice of the determining variables other than EEI. Moreover, Kenen and Voivodas (1972), even though it is implicitly understandable that it adopted a Harrod-Domar growth framework, is also criticised for the absence of derivation procedure for the estimating equation. Usually, the derivational procedure is expected to start from one of the underlying growth models.

To avoid such arbitrary selection of estimating equations and fill the gap of the absence of systematically derived framework, in this study, it will be derived analytically using Feder's (1982) formulation as a point of departure. In Feder's formulation endogeneous growth model was the starting point.

3. THE MODEL

Feder's (1982) formulation links export expansion to economic growth as follows.

$$\frac{dY}{Y} = \beta_1 \frac{I}{Y} + \beta_2 \frac{dL}{L} + \left(\left(\frac{\sigma}{\sigma+1}\right) + \lambda\right)\left(\frac{dX}{X}\right)\left(\frac{X}{Y}\right) \qquad [3.1]$$

Where dY/Y, dL/L and dX/X stand for GDP growth, labour growth and export earnings growth respectively, I/Y and X/Y are investment and export to GDP ratios respectively, and β_1, β_2, $\sigma/(\sigma+1)$ and λ are parameters representing marginal physical product of capital, output elasticity of labour, factor productivity differential of export sector and externality of export sector on non-export sector, respectively.

If we assume that there is some part of total factor productivity that is not affected by trade policy the formulation will take a constant term, β_0

$$\frac{dY}{Y} = \beta_0 + \beta_1 \frac{I}{Y} + \beta_2 \frac{dL}{L} + \left(\left(\frac{\sigma}{\sigma+1}\right) + \lambda\right)\left(\frac{dX}{X}\right)\left(\frac{X}{Y}\right) \qquad [3.2]$$

Equation [3.2] expresses growth as a function of trade, labour growth and investment-GDP ratio. It says that trade affects growth only if there is factor productivity differential (FPD) and positive externality of export sector on non-export sector. In the extreme case, if the sum of FPD and externality is negative, trade has a deterring effect on growth.

We try to extend this model in such a way that it captures a variable of uncertainty, or export earnings instability. The inclusion of the EEI in the growth model presumes that it is transmitted to the rest of the economy, and such instability is detrimental to sustainable economic growth. In fact, this argument depends on the assumption we make about the behaviour of agents; i.e., whether we assume they are risk-averse or not. Moreover, changes in export proceeds will affect the economy by affecting incomes of producers in the export sectors, thereby affecting domestic expenditure for consumption and investment. It influences the multipliers and accelerators as well (Lim 1976). Furthermore, the adversity of EEI can be seen from its impact on the level of investment, which results from business miscalculations and/or the speculative behaviour it encourages (Myrdal 1956).

A lower level of investment means lower economic growth. Instability also results in a discontinuous flow of imports of intermediate and capital goods that are crucial to the implementation of development plans. In stating the link between instability and growth, Barro (1976 and 1980) argues that lack of stability creates an atmosphere of uncertainty, makes it difficult for economic agents to extract the correct signals from relative prices, such as real returns to investment, and thus leads to inefficient allocation of resources.

On the basis of this argument, export earnings, X, is divided into its reliable or certain component, x, and unreliable or uncertain component, u, as

$$X = x + u$$

Fluctuations of revenue are undesirable only in so far as they do not serve as guide to the allocation of resources to bring about appropriate long run adjustment in supply and demand. Hence, in using the term instability to refer to such undesirable revenue fluctuations, there is a problem in distinguishing between those that are desired and those which are excessive or misleading. To proceed in getting the components of exports apart, we have to get some concise definition of export instability. In line with MacBean (1966), Lancier (1978) defined EEI as the residual variability of export values after correcting for trend. Charette (1985) uses EEI to denote unexpected fluctuation in export markets, which agrees conceptually with that of Glezakos (1983). It is possible to consider both definitions by assuming that the agents' expected value of export corresponds to the mathematically derived trend value. In fact, this assumption is not an arbitrary one, rather it is in line with the theory of rational expectation that considers agents as rational thinkers in their decision making.

Having defined EEI this way, next we look for a means of measuring it. It is usually measured as the short-term or yearly fluctuations of export proceeds around the growth trend of exports (Naya 1973). Nguyen (1980) also states that trend value is likely to be the best estimator of long run revenue so that the term instability should refer only to the short-term export earnings fluctuations around its trend.

Accordingly, we transform [3.2] into a time series equation by adding a subscript t as:

$$\frac{dY_t}{Y_t} = \beta_0 + \beta_1 \frac{I_t}{Y_t} + \beta_2 \frac{dL_t}{L_t} + \beta_9 \left(\frac{dX_t}{X_t}\right)\left(\frac{X_t}{Y_t}\right) \qquad [3.3]$$

Where $\beta_9 = \sigma/(\sigma+1) + \lambda$

Assuming constant output elasticity of export, ε, we get

$$\varepsilon \frac{\partial Y_t}{\partial X_t} = \frac{X_t}{Y_t}$$

Substituting $\varepsilon \frac{\partial Y_t}{\partial X_t}$ for $\frac{X_t}{Y_t}$ and $x_t + u_t$ for X_t in [3.3] and a little algebraic manipulation, we get

$$\frac{dY_t}{Y_t} = \beta_0 + \beta_1 \frac{I_t}{Y_t} + \beta_2 \frac{dL_t}{L_t} + \mu\left(\frac{d(x_t + u_t)}{(x_t + u_t)}\right)$$

Which can be rewritten as

$$\frac{dY_t}{Y_t} = \beta_0 + \beta_1 \frac{I_t}{Y_t} + \beta_2 \frac{dL_t}{L_t} + \mu\Psi_{1t}\left(\frac{dx_t}{x_t}\right) + \mu\Psi_{2t}\left(\frac{du_t}{u_t}\right) \qquad [3.4]$$

where $\Psi_{1t} = \left\{\frac{1}{\left(1 + \frac{u_t}{x_t}\right)}\right\}$ and $\Psi_{2t} = \left\{\frac{1}{\left(1 + \frac{u_t}{x_t}\right)}\right\}$

Having defined EEI this way, next we look for a means of measuring it. It is usually measured as the short-term or yearly fluctuations of export proceeds around the growth trend of exports (Naya 1973). Nguyen (1980) also states that trend value is likely to be the best estimator of long run revenue so that the term instability should refer only to the short-term export earnings fluctuations around its trend.

Accordingly, we transform [3.2] into a time series equation by adding a subscript t as:

$$\frac{dY_t}{Y_t} = \beta_0 + \beta_1 \frac{I_t}{Y_t} + \beta_2 \frac{dL_t}{L_t} + \beta_9 \left(\frac{dX_t}{X_t}\right)\left(\frac{X_t}{Y_t}\right) \qquad [3.3]$$

Where $\beta_9 = \sigma/(\sigma+1) + \lambda$

Assuming constant output elasticity of export, ε, we get

$$\varepsilon \frac{\partial Y_t}{\partial X_t} = \frac{X_t}{Y_t}$$

Substituting $\varepsilon \frac{\partial Y_t}{\partial X_t}$ for $\frac{X_t}{Y_t}$ and $x_t + u_t$ for X_t in [3.3] and a little algebraic manipulation, we get

$$\frac{dY_t}{Y_t} = \beta_0 + \beta_1 \frac{I_t}{Y_t} + \beta_2 \frac{dL_t}{L_t} + \mu\left(\frac{d(x_t + u_t)}{(x_t + u_t)}\right)$$

Which can be rewritten as

$$\frac{dY_t}{Y_t} = \beta_0 + \beta_1 \frac{I_t}{Y_t} + \beta_2 \frac{dL_t}{L_t} + \mu\Psi_{1t}\left(\frac{dx_t}{x_t}\right) + \mu\Psi_{2t}\left(\frac{du_t}{u_t}\right) \qquad [3.4]$$

where $\Psi_{1t} = \left\{\frac{1}{\left(1 + \frac{u_t}{x_t}\right)}\right\}$ and $\Psi_{2t} = \left\{\frac{1}{\left(1 + \frac{u_t}{x_t}\right)}\right\}$

Here, we are concerned with the long run effect of uncertainty and export, and not with the one time effect like Ψ_{11} and Ψ_{21}. In other words, our interest does not lie with what has happened but also what could have happened but did not, and what will happen. For this purpose Ψ_{11} and Ψ_{21} have to be substituted with their long run expected values denoted by Ψ_1 and Ψ_2 respectively. After such substitution, our growth estimating equation will be:

$$\frac{dY_t}{Y_t} = \beta_0 + \beta_1 \frac{I_t}{Y_t} + \beta_2 \frac{dL_t}{L_t} + \mu\Psi_1\left(\frac{dx_t}{x_t}\right) + \mu\Psi_2\left(\frac{du_t}{u_t}\right) \qquad [3.5]$$

After adjusting the instability variable for scale, small sample bias and degrees of freedom, [3.5] will be

$$\frac{dY_t}{Y_t} = \beta_0 + \beta_1 \frac{I_t}{Y_t} + \beta_2 \frac{dL_t}{L_t} + \beta_3\left(\frac{dx_t}{x_t}\right) + \beta_4\left(\frac{di_t^2}{i_t^2}\right) \qquad [3.6]$$

Where $\beta_3 = \mu\Psi_1$, $\beta_4 = ½\,\mu\Psi_2$ and i_t^2, which is Export Earnings Instability Index (or uncertainty index), is given as

$$i_t^2 = \frac{u_t^2}{\overline{X}^2}\frac{N}{N-K}$$

Where N is size of sample included in the study, K is number of explanatory variables used to estimate trend values.

Equation [3.6] relates changes in stable components of export revenue and changes in export instability to economic growth. The parameters β_0, β_1 and β_2 are expected to have positive signs on the ground of economic growth theories. Similarly, the sign of Ψ_1 and Ψ_2 are expected to be positive and negative, respectively. For the proof of this argument see Appendix-1.

4. POLICY IMPLICATIONS OF THE MODEL

We can derive the policy implication of the model after some mathematical manipulations as follows. For trade to contribute positively to economic growth, the sum of the effects of the stable and unstable components of export earnings has to be positive.

That is,

$$\beta_3\left(\frac{dx_t}{x_t}\right)+\beta_4\left(\frac{di_t^2}{i_t^2}\right)\rangle 0$$

$$\Rightarrow\left(\left(\frac{\sigma}{\sigma+1}\right)+\lambda\right)\frac{\mu}{\beta_9}\Psi_1\frac{dx_t}{x_t}+\left(\left(\frac{\sigma}{\sigma+1}\right)+\lambda\right)\frac{\mu}{\beta_9}\Psi_2\frac{1}{2}\frac{di_t^2}{i_t^2}\rangle 0 \qquad [4.1]$$

$$\Rightarrow\left(\left(\left(\frac{\sigma}{\sigma+1}\right)+\lambda\right)\left(\frac{\mu}{\beta_9}\Psi_1\frac{dx_t}{x_t}+\frac{\mu}{\beta_9}\Psi_2\frac{1}{2}\frac{di_t^2}{i_t^2}\right)\right)\rangle 0 \qquad [4.2]$$

Conditionality [4.2] can be satisfied if both items in the brackets are positive or if both are negative. Let us consider it case by case.

Case 1. $\left(\left(\frac{\sigma}{\sigma+1}\right)+\lambda\right)\rangle 0$

Under this case,

$$\frac{\mu}{\beta_9}\Psi_1\frac{dx_t}{x_t}+\frac{\mu}{\beta_9}\Psi_2\frac{1}{2}\frac{di_t^2}{i_t^2}\rangle 0$$

Now from the variables di_t^2/i_t^2 and dx_t/x_t, we understand that the former is more or less exogenous to public policies. Hence, we solve for dx_t/x_t and we get

$$\frac{dx_t}{x_t}\rangle -\frac{1}{2}\frac{\Psi_2}{\Psi_1}\frac{di_t^2}{i_t^2} \qquad [4.3]$$

If EEI is exhibiting growth over time, since Ψ_1 and Ψ_2 are expected to be positive and negative, respectively, the coefficient of di_t^2/i_t^2 is expected to be positive. The policy implication of the model according to [4.3] is then, if factor productivity differential and export externality is positive, $(((\sigma/(\sigma+1)) + \lambda) > 0)$, then, to have growth promoting trade, the growth of stable component of export has to be kept above some positive level, where the level is determined by growth of EEI. In this case, if EEI is unchanging overtime, then positive exports growth is a guarantee for trade to promote economic growth.

Case 2. $$\left(\left(\frac{\sigma}{\sigma+1}\right)+\lambda\right) < 0$$

In this case, to have a positive contribution of trade to economic growth, the item in the second brackets of conditionality [4.2] has to be negative. i.e.

$$\frac{\mu}{\beta_0}\Psi_1\frac{dx_t}{x_t} + \frac{\mu}{\beta_0}\Psi_2\frac{1}{2}\frac{di_t^2}{i_t^2} < 0$$

$$\frac{dx_t}{x_t} < -\frac{1}{2}\frac{\Psi_2}{\Psi_1}\frac{di_t^2}{i_t^2} \qquad [4.4]$$

The policy implication of the model based on [4.4] is that if $((\sigma/(\sigma+1)) + \lambda) < 0$, then for trade to promote growth, the growth of stable component of export has to be kept below some level where the level is determined by change in EEI. Here again, if EEI is unchanging, having a negative growth in the stable components of export is a sufficient condition for the contribution of trade to economic growth. Here, too, the implication agrees with the idea of efficient resource allocation. Under such situations, Import Substitution Industrialisation (ISI) serves better than export promoting policies.

Finally, conditionality [4.3] suggests that there is some level below which export-promoting policy may not contribute to economic growth. If the growth rate of stable components of export is above that level, then the conditionality suggests the policy has to be backed up by mechanisms that limit or suppress di^2/i^2 or change in EEI to some minimum possible level. There, then, we do not face resource misallocation by the suggested policy. If such mechanisms are not available, be it from inside or outside, ISI serves better the purpose of accelerating economic growth.

5. ECONOMETRIC ANALYSIS

5.1. The Data

The statistical data used for estimating model [3.6] and conditionality [4.3] or [4.4] is taken from Financial Statistics Yearbook–1997, published by IMF (cf. IMF (1997)). There are four basic variables that are used by the model: Gross Domestic Product (GDP), Investment to GDP ratio, Population, and Exports.

The time series data for the first variable is given in the yearbook as a percentage increase of GDP at constant price over the previous year. The investment to GDP ratio data, as described in the yearbook, is the percentage share of investment in GDP. Investment comprises gross fixed capital formation and increase or decrease in the stocks. The population data were given as a mid-year population estimate of each country. Lastly, export data are value of exports from each country expressed in USD. The export data were further decomposed into their stable and unstable components to generate uncertainty variable that was used as a fifth variable.

The length of the series obtained for each variable varies from country to country and those countries having data series of length below 20 were omitted from the analysis to refrain from committing small sample bias. Moreover, Madagascar and Liberia were omitted from the data set for their data series lengths do not correspond to those of the remaining countries. Accordingly, 15 countries were selected from SSA countries, namely, Benin, Botswana, Burundi, Cameroon, Congo, Ethiopia, Ghana, Kenya, Mauritius, Nigeria, South Africa, Sierra Leone, Swaziland, Togo and Zambia. The length of the time series data was determined in such a way that it maximises the number of sample countries as well as the number of observations for each country. Accordingly, 1971-1990 was chosen for the analysis.

To decompose export data into their components, suitable trend that fits the data properly was needed. Generally one can expect three types of trends–exhibiting declining growth, constant growth and increasing growth. The values of the selected type of trend were considered to be measures of stable component whereas their residuals were taken to represent the unstable component. The choice among the three types of trends was made on the grounds of co-integration tests coupled with explanatory power of the curve fitted to the export data. That is, if the growth of stable and unstable components of the data cointegrate with the other variables (GDP growth, Investment to GDP ratio, Population growth), then it is considered to be a representative trend, and if there exist two or more of such curves then the decision was made on the ground of their explanatory power, R^2. Using data generated in this way, in subsequent sections attempt is made to estimate our analytical model derived in section-4.

5.2. Panel Data Analysis

According to Hsiao (1985), modelling a panel data set offers a number of advantages over traditional pure cross-sectional or pure time service data set. The most obvious advantage is that the number of observations is typically much larger in panel data. This quality is likely to produce more reliable parameter estimates, and most importantly enables one to specify and test more sophisticated models which incorporate less restrictive behavioural assumptions. To gain these advantages for our study and be able to derive a conclusive result for the region of study, in subsequent subsections attempt is made to employ this approach of analysis.

5.2.1. Model Specification

We specify equation (3.6) as ordinary regression model and confront the basic assumptions of this model with statistical test of validation. The model is said to have two basic advantages if its assumptions are valid. First, it is parsimonious–estimating small number of parameters with a large number of observations. Second, it is computationally simple. That is, by pooling the data set, a single equation is estimated by OLS estimation technique.

The model takes the form of

$$Y_{it} = B_{1it}X_{1it} + B_{2it}X_{2it} \ldots + B_{kit}X_{kit} + U_{it} \ldots\ldots\ldots\ldots \qquad [5.1]$$

$B_{kit} = B_k$ for all i and t...Assumtion-1

$U_{it} \sim i.i.d\ (0,\sigma^2)$...Assumtion-2. Where $i = 1 \ldots N$, $t = 1 \ldots T$;

N and T being number of units and time length included in the study. If inclusion of constant term is required X_{1it} will be equal to one and there will be K-1 regressors.

The implication of the assumptions under this model specification is that it considers the uniformity of behaviour across units and in time, and that the observations are homogeneous or drawn from the same population.

Accordingly, the ordinary regression model specification of equation (3.6) will take the form

$$\left(\frac{dY}{Y}\right)_{it} = \beta_{0it} + \beta_{1it}\left(\frac{I}{Y}\right)_{it} + \beta_{2it}\left(\frac{dL}{L}\right)_{it} + \beta_{3it}\left(\frac{dx}{x}\right)_{it} + \beta_{4it}\left(\frac{di^2}{i^2}\right)_{it} + U_{it} \qquad [5.2]$$

$\beta_{it} = \beta_k$ for all i and t.....Assumtion-1

$U_{it} \sim i.i.d\ (0, \sigma^2)$.....Assumtion-2

Where $i = 1 \ldots N$, $t = 1 \ldots T$, (N=15) and (T =20 years) being number of countries and time length included in the study respectively.

5.2.2. Model Estimation

Under model estimation, the first task is testing the validity of the assumption imposed on the model. This test tells us whether or not the specification is adequate. The suitable test statistics for this purpose is F–test. It compares the unrestricted residual sum of squares i.e. model [5.2] without Assumption 1 with the restricted residual sum of squares, the restriction being the first assumption given in the model above. The test result is given in Table 5.1. It indicates that the null hypothesis that states the parameters are similar across the countries can not be rejected at 5% level of significance (P=0.0693). This result implies that there exists a uniformity of behaviour of countries in their economic performance. Non-rejection of the null hypothesis suggests the acceptance of pooling the data set to estimate a single equation. This in turn implies that we can use the total or (plain OLS) estimate as parameter estimates of [3.6]. The estimation result is reported in Table 5.1 below.

The table reports that investment to GDP ratio has the expected positive sign. Moreover, the t-ratio indicates that the variable is a strong determinant of GDP growth. The coefficient is significantly different from zero at 1% level of significance. The estimated coefficient suggests that in the region, a 1% increase (decrease) in the share of investment from GDP (that approximate capital growth) can increase (decrease) the GDP growth by 0.09%.

In the case of population growth variable we find an unexpected sign. From economic theory we know that the more the labour grows the more economic performance will be. However, here the estimate indicates the reverse relation. But, since the estimate could not pass test of significance at 5% level of significance, we can not conclude strongly that we are having a result differing from prediction of economic theory. Even if it passes the test such result can occur due to excessive unemployment and under-employment. Feder (1982), for example, emphasises, with some exceptions of the general prediction, by saying that the coefficient of labour growth should be significantly more than zero if labour surplus was not the prevalent situation in sample countries during the period covered.

The last two variables are the basic areas of attention for this study. The sign of the stable component of export certainly agrees with the claims of OOEP advocates, or with our expectation under the assumption of risk aversity and positive factor

differential in export sector. Moreover the estimate is significantly different from zero at 1% level of significance. The estimate found here does not vary from the estimates reported by different researchers. Feder (1982), for example, based on his cross-sectional study of semi-industrialised LDC's, reports the estimate to vary from 0.390 to 0.422. Berg and Schmidt (1994), based on time series study of Latin American countries, report the parameter estimate to vary from 0.051 to 0.332, which is slightly less than our estimate.

Table 5.1. Regression Estimates Using Panel Data Set
TOTAL (Plain OLS) Estimates

Variable	Estimated Coefficient	Standard Error	t-statistic
INVGDPR	0.099494	0.033277	2.98990**
POPG	-0.021615	0.040537	-0.533202
EXPOG	0.402179	0.062763	6.40790**
EEIG	-0.38286E-03	0.154312E-03	-2.48107*
C	-1.16177	0.693724	-1.67468

* Significant at 5% level. ** Significant at 1% level.

F test of A,B=Ai,Bi: F(65,230) = 1.2143, P-value = [.06931] Critical F value for diffuse prior (Leamer, p.114) = 8.6381, T=20, N=15.

Between (OLS on Means) Estimates

Variable	Estimated Coefficient	Standard Error	t-statistic
INVGDPR	-0.063468	0.099728	-0.636413
POPG	0.316805	0.395557	0.800908
EXPOG	0.623974	0.138863	4.49345**
EEIG	-0.396823E-04	0.821141E-04	-0.483258
C	-0.740459	2.00773	-0.368804

* Significant at 5% level. ** Significant at 1% level.

The estimate obtained here suggests that a 1% increase (decrease) in stable component of export can bring 4 basis point increase (decrease) in GDP growth of the region. In fact, the elasticity here cannot be directly compared with the estimate cited above for we are dealing with the stable component of the variable alone. But the above results may give a rough estimate of our elasticity. The result obtained here supports the claim of OOEP advocates if we could get enough reason to assume absence of uncertainty. However, since we are aiming at examining its absence, it seems illegitimate to make a priori assumption. Hence, we have to consider the presence of uncertainty initially and the regression assigns zero coefficient if it is not really there. Based on the underlying assumptions we made about the agents and the sectors of the economy, we expect the coefficient of variable of uncertainty (β_4) to have a negative sign. The estimated model shows that the coefficient has a sign that

agrees with this expectation. Moreover, the coefficient was found to be statistically significant at 5% level of significance. At first glance, the estimate seems infinitesimal but since the growth in variable of uncertainty i.e. growth of EEI is a very large number, its impact on growth can not be neglected. From the sign and statistical significance of this estimate we can argue that uncertainty has been one of the factors that have been deterring economic growth in the region. Furthermore, we can infer that, if the structure of traded commodities remain unchanging (i.e. if not vertically diversified), uncertainty is one of the factors that deter economic growth of SSA region.

The estimated model from the mean data has additional information concerning the methodological problem faced in estimating the effect of OOEP in 1970s based on cross-sectional data. The between (OLS on means) estimate is similar to cross-section analysis as it runs OLS on the time-wise averages. Two basic points stand clear from this estimate. First, we observe that the coefficient of dx/x is greater in this case than the proceeding one (0.6239 in the latter approach and 0.4021 in the former case). That is, cross-sectional analysis has an exaggerating effect on the parameter estimate. Such results of cross-sectional data have induced empirical researchers of 1970s to conclude their studies in favour of OOEP. The second interesting result is that the variable of uncertainty (di^2/i^2) has extremely small and insignificant coefficient. That is, when we take the time-wise average of uncertainty, its negative impact on GDP growth or economic performance will be unobservable. Thus the–OLS on mean–result, being set in accordance with neo-classical assumption (absence of uncertainty), gives the overstated effect of OOEP on economic growth.

Next ia also of interest to estimate the long run cost/benefit of OOEP on the region by considering the mean of export growth over the twenty years and the mean of variable of uncertainty, by taking the parameter estimates of the fourth and fifth components of the model, and average values of the variables in the study period. The result leads one to conclude that the region has been loosing 0.153% growth of GDP per year (see Annex-1) due to export. That is, the region was not in a position to fulfil condition [4.3]. The estimate here indicates that, as far as the structure of traded commodities is unchanged, the net effect of OOEP in the region in the long run is deterring economic performance rather than what is suggested conventionally.

Finally, as we have seen in section 2, policy choice in the region is not purely made internally. Be it willingly or unwillingly, there are external influences. Hence, one may ask questions like, under what condition will OOEP be effective to serve its face value for the region? Answering such questions demands solving some minimum requirements for stable export growth, given by conditionality [4.2]. Assuming that the pattern of uncertainty generated from export volatility that has prevailed in the past will repeat itself in the future, we can estimate the minimum growth required in stable component of export that could overcome the adverse effect of uncertainty in the long

run. Accordingly, the minimum growth required in stable component of export for the region is 7.1874% per year (see Annex 3). Thus, to have benefited from the policy, the region has to be able to keep its stable export growth above this critical point. Indeed, fulfilment of such condition can be met if there is enough external demand for SSA products and if there is production capacity improvement. On the other hand, the deteriorating nature of demand for primary products has been emphasised by a number of researchers, which makes the attainment of such target very unlikely. Under this circumstance, there should exist trade agreements between the region and other trading partners that make the later absorb some part of volatility, say, like export earnings stabilisation scheme, as far as there is external insistence for OOEP. Otherwise, SSAs better refer to their post independence economic history that gives a better hint for accelerating economic growth of the region.

6. SUMMARY AND CONCLUSION

6.1. Summary

By making a point of departure, Feder's (1982) formulation and decomposing export variable into its stable and unstable components, an equation that links uncertainty to economic growth was developed.

From this derivation, it is possible to conclude that uncertainty deters economic growth if the agents are risk-averse, and if there is a positive factor differential in the export sector and a positive externality of the export sector on the non-export sector. Similarly, if these three assumptions hold, the growth of stable component of export contributes positively to economic growth. Under this circumstance, the point requiring due attention is whether or not the cost incurred by uncertainty from export instability is compensated by the benefit thereof. The analysis implies that if the growth of stable component is very low and the volatility is very high there is a risk of loss of economic growth. This situation resembles the case of agricultural commodity exports, since the demand for these commodities deteriorates overtime and the supply side depends on uncontrollable and unpredictable factors. That is, the prevailing situation on the demand side limits the growth of the stable component of export while the situation on the supply side, coupled with some adverse factors from the demand side, promotes the volatility of export over time. Hence, it is difficult to rely on outward-oriented economic policy for the purpose of accelerating economic growth as far as the region remains primary commodity exporter.

The econometric analysis gives empirical evidence supporting this argument. The analysis was made using panel data to derive concise conclusion about the region, while being refrained from the shortcomings of cross-sectional data. The result of the analysis indicates that the structure of the traded commodities of the region has to allow an

annual growth rate of at least 7.5% in its stable component of export to benefit from implementing such a policy.

6.2. Conclusion

Despite the conventionally held view about the outward-oriented policy, the analytical results obtained here indicate that the policy is effective, in terms of accelerating economic growth, only if some economic conditions are fulfilled. These conditions are specified in terms of growth of stable components of export. To benefit from the policy, the required level of export growth may lie above the reach of some countries since growth will not be determined solely by internal factors. Even if growth is determined by internal factors alone, these factors may not purely be in the hands of economic agents, especially in the case of production of agricultural commodities. Hence, the option of raising the growth of stable component of export may not always be practical. An alternative, for those who could not fulfil the condition, is to suppress volatility of export earnings. This in turn requires either resource mobilisation away from the highly uncertain sector–agricultural–or the existence of some mechanism from trade partners' side arranged to cover the risk of loss emerging from the policy. Otherwise, it is better if SSA countries refer to their post independence policy choice and growth history that provides a good hint for solving the growth problems of the region.

REFERENCES

Barro, R.J. (1976) Rational Expectations and the Role of Monetary Policy', ***Journal of Monetary Economics***, V, 2: 1-32.

Barro, R. J. (1980) 'A Capital Market in an Equilibrium Business Cycle Model', ***Econometrica***, V, 48: 1393-417.

Batra, R. N. (1975) 'Production Uncertainty and the Heckscher-Ohlin Theorem', ***Review of Economic Studies***, V, 42: 259-68.

Berg, H. K. and Schmidt, J. R. (1994) 'Foreign Trade and Economic Growth; Time Series Evidence from Latine America', ***Journal of International Trade and Economic Development***, 3(3): 249 - 68.

Charette, M. F.(1985) 'Determinants of Export Instability in the Primary Commodity Trade of The LDCs', ***Journal of Development Economics***, V, 18: 13-21.

Cuddington, J. T., Liang, H. and Lu, S. (1996) 'Uncertainty Trade and Capital Flows in Sub-Saharan Africa,' ***Journal of African Economies***, 5(3): 192-224.

Dornbusch, R. (1992) 'The Case for Trade Liberalisation in Developing Countries', ***Journal of Economic Perspective***, 6(1).

Dumas, B. (1980) 'The Theorems of International Trade Under Generalised Uncertainty', ***Journal of International Economics***, V, 10: 481-98.

Easterly, W. and Levein, R. (1997) 'African Growth Tragedy: Policies and Ethnic Divisions', ***Quarterly Journal of Economics***, 112(4): 1203-50.

Feder G. (1982) 'On Export and Growth', ***Journal of Development Economics***, 12(1-2): 59 - 73.

Glezakos, C. (1973) 'Export Instability and Economic Growth: A Statistical Verification', ***Economic Development and Cultural Change***, V, 21, (July): 670-79.

Glezakos, C. (1983) 'Instability and the Growth of Exports', ***Journal of Development Economics***, V, 12: 229–36.

Helpman, E. (1988) 'Trade Patterns under Uncertainty with Country Specific Shocks', ***Econometrica***, V, 56: 645-59.

Hsiao, C. (1985) 'Benefits and Limitations of Panel Data', ***Econometric reviews***, 4(1): 121–74.

IMF (1997), International Financial Statistics Yearbook, 1997.

Kenen, P. B. and Voivodas, C.S. (1972), 'Export Instability and Economic Growth', ***Kyklos***, 25(4).

Lancier, E. (1978). 'Export Instability and Economic Development: a Reappraisal', ***Banca Nazionale del Lavoro***, No.125, pp. 135-51.

Lim, D. (1976) 'Export Instability and Economic Growth: A Return to Fundamentals', ***Oxford Bulletin of Economic and Statistics***, 38(4): 311 - 22.

MacBean, A. I. (1966). ***Export Instability and Economic Development***. Cambridge, M.A.: Harvard University Press.

Mayer, W. (1976). 'The Rebczynski, Stolper-Samuelson and Factor Price Equalisation Theorems Under Price Uncertainty', ***American Economic Review***, V, 66: 796-808.

Myrdal, G. (1956). ***International Trade and Development***. New York: Harper and Bros.,

Naya, S. (1973) 'Fluctuations in Export Earnings and Economic Patterns of Asian Countries', ***Economic Development and Cultural Change***, V, 21, (July): 629-41.

Nguyen, D. (1980) 'Partial Price Stabilisation and Export Earning Instability', ***Oxford Economic Papers***, 32(2): 341-52.

Pomery, J. (1984) 'Uncertainty in Trade Models', in R.W. Jones and P.B. Kenen (eds.) ***Handbook in International Economics***, vol. I, Amsterdam: North Holland.

Ram, R. (1985) 'Export and Economic Growth: Some Additional Evidence', ***Economic Development and Cultural Change***, V, 33 (Jan.): 415 - 25.

Sachs, J. D. and Warner A. M. (1997) 'Sources of Slow Growth in African Economies', ***Journal of African Economies***, 6(3): 335-76.

Sakai, Y. (1978) 'A Simple General Equilibrium Model of Production: Comparative Statistics with Price Uncertainty', ***Journal of Economic Theory***, V, 19: 287-306.

Strydom, P. D. F. (1995) 'International Trade and Economic Growth', ***The South African Journal of Economics***, 63(4): 556-69.

UNCTAD (1998), The Least Developed Countries, 1998 Report, UNCTAD/LDC.

APPENDIX 1. THE EXPECTED SIGNS OF Ψ_1 AND Ψ_2

1.1. The Expected Sign of Ψ_1

The sign of Ψ_1 is expected to be positive i.e. $\Psi_1 = E(\Psi_{1i}) > 0$

Proof:

Expected utility analysis indicates that uncertainty hampers output level if the agents are risk avers type. That is

$$\sum_{t=1}^{N} X_t < \sum_{t=1}^{N} x_t \qquad [A1.1]$$

Where X_t –export earnings at period t, and x_t –the trend value of export earnings at period t.

Inequality of (A1.1) implies $\sum X_t - \sum x_t < 0$

$$\Rightarrow \quad \sum(X_t - x_t) < 0; \qquad \Rightarrow \quad \sum(1 - x_t/X_t) < 0$$

$$\Rightarrow \quad n - \sum(x_t/X_t) < 0 \qquad \Rightarrow \quad \sum(x_t/X_t) \cdot 1/n > 1$$

Accordingly, lets consider the probability density function f(.) of x_t/X_t. Assume uniform distribution in discrete form i.e. f(.) = 1/n and "E"denote the mathematical expectation, then

$$\sum(xt/Xt) \cdot 1/n > 1 \quad \Leftrightarrow \quad E(x_t/X_t) > 1 \qquad [A1.2]$$

$$\Rightarrow E\left[\frac{x_t}{(X_t - x_t) + x_t}\right] > 1$$

$$\Rightarrow E\left[\frac{1}{[(X_t - x_t) + x_t]/x_t}\right] > 1 \ldots\ldots\ldots\ldots\ldots i.e. \psi_1 = E(\psi_{1i}) > 1$$

This proof proposes that, if a) all agents are risk-averse and b) export sector has relatively higher factor productivity and positive externality on non-export sector, then expected export growth could promote economic growth keeping other factors unchanging.

1.2. The Expected Sign of Ψ_2

The sign of Ψ_2 is expected to be negative. i.e. $\Psi_2 = E(\Psi_{2t}) < 0$.

Proof:

From [A1.2] above

$$E(x_t/X_t) > E(1) \quad \Rightarrow \quad E((x_t/X_t)-1) > 0$$

$$\Rightarrow \quad E[x_t - X_t)/X_t] > 0 \quad \Rightarrow \quad E[(X_t-x_t)/X_t] < 0$$

$$E[u_t/X_t]<0 \quad E[u_t/(u_t+x_t]<0$$

$$\Rightarrow E\left[\frac{1}{[u_t + x_t]/u_t}\right] < 0 \ldots\ldots\ldots\ldots\ldots i.e. \psi_2 = E(\psi_{2t}) < 0$$

This proof, on the other hand, proposes, if assumption associated with [A1.2] holds true, then expected growth in export earnings instability can deter economic growth keeping other factors constant.

APPENDIX 2

From descriptive statistics, we know that average annual GDP growth rate of the region (r^*) will be

$$r^* = \frac{\sum_{i=1}^{T}\sum_{t=1}^{N}\left(\frac{dY}{Y}\right)_{it}}{NT} \qquad [A2.1]$$

By substituting the right hand side of equation [5.2] in [A2.1], we get

$$r^* = \frac{\sum_{i=1}^{T}\sum_{t=1}^{N}(\hat{\beta}_0)}{NT} + \frac{\sum_{i=1}^{T}\sum_{t=1}^{N}\hat{\beta}_1\left(\frac{I}{Y}\right)_{it}}{NT} + \frac{\sum_{i=1}^{T}\sum_{t=1}^{N}\hat{\beta}_2\left(\frac{dL}{L}\right)_{it}}{NT} + \frac{\sum_{i=1}^{T}\sum_{t=1}^{N}\hat{\beta}_3\left(\frac{dx}{x}\right)_{it}}{NT} + \frac{\sum_{i=1}^{T}\sum_{t=1}^{N}\hat{\beta}_4\left(\frac{di^2}{i^2}\right)_{it}}{NT} \ldots A2.2$$

To get average annual contribution of trade to growth($r^*_{4,5}$), we take the sum of the fourth and fifth components of the right hand side of A2.2, as

$$r^*_{4,5} = \frac{\sum_{t=1}^{T}\sum_{i=1}^{N}\hat{\beta}_3\left(\frac{dx}{x}\right)_{it}}{NT} + \frac{\sum_{t=1}^{T}\sum_{i=1}^{N}\hat{\beta}_4\left(\frac{di^2}{i^2}\right)_{it}}{NT} \quad \text{.....A2.3}$$

[A2.4] indicates the sought contribution in the past can be estimated by multiplying the parameter estimates by the mean of their respective variables. Accordingly,

$$r^*_{4,5} = \hat{\beta}_3 \frac{\sum_{t=1}^{T}\sum_{i=1}^{N}\left(\frac{dx}{x}\right)_{it}}{NT} + \hat{\beta}_4 \frac{\sum_{t=1}^{T}\sum_{i=1}^{N}\left(\frac{di^2}{i^2}\right)_{it}}{NT} = \hat{\beta}_3\overline{\left(\frac{dx}{x}\right)} + \hat{\beta}_4\overline{\left(\frac{di^2}{i^2}\right)} \quad \text{.....A2.4}$$

$$r^*_{4,5} = 0.402179 \times 6.807132 + (-0.0003828) \times 7550.16 = -0.153\%$$

APPENDIX 3

To gain long run benefit from trade in the form of growth $r^*_{4,5}$ in [A2.3] of Annex 2 has to be positive, i.e. the net effect of trade has to be positive.

That is

$$r^*_{4,5} = \frac{\sum_{t=1}^{T}\sum_{i=1}^{N}\hat{\beta}_3\left(\frac{dx}{x}\right)_{it}}{NT} + \frac{\sum_{t=1}^{T}\sum_{i=1}^{N}\hat{\beta}_4\left(\frac{di^2}{i^2}\right)_{it}}{NT} > 0 \quad \text{.....A3.1}$$

A sufficient condition to fulfil requirement A3.1 is to keep growth of stable component of export above some level as

$$\left(\frac{dx}{x}\right)_{it} > \frac{-\hat{\beta}_4}{\hat{\beta}_3}\frac{\sum_{t=1}^{T}\sum_{i=1}^{N}\left(\frac{di^2}{i^2}\right)_{it}}{NT} = \frac{-\hat{\beta}_4}{\hat{\beta}_3}\overline{\left(\frac{di^2}{i^2}\right)} \quad \text{.....A3.2}$$

If the region fulfils condition A3.2 then the required target A3.1 can be met. Algebraically,

$$\left(\frac{dx}{x}\right)_{it} > \frac{-\hat{\beta}_4}{\hat{\beta}_3}\overline{\left(\frac{di^2}{i^2}\right)} = \frac{0.0003828}{0.402179} \times 7550.16 = 7.1874\%$$